Claims:

1. A method for growing a thin film onto a substrate, in which method a substrate placed in a reaction space (1; 21) is subjected to alternately repeated surface reactions of at least two vapor-phase reactants for the purpose of forming a thin film, said method comprising

- feeding said reactants in the form of vapor-phase pulses repeatedly and alternately, each reactant separately from its own source, into said reaction space (1; 21), and
- bringing said vapor-phase reactants to react with the surface of the substrate for the purpose of forming a solid-state thin film compound on said substrate,

c h a r a c t e r i z e d in that

- the gas volume of said reaction space is evacuated essentially totally between two successive vapor-phase reactant pulses.

2. A method as defined in claim 1, c h a r a c t e r i z e d in that said gas volume of said reaction space (1; 21) is evacuated at least twice, advantageously at least 3 - 10 times during the interval between said vapor-phase reactant pulses.

3. A method as defined in claim 1 or 2, c h a r a c t e r i z e d in that said gas volume of said reaction space (1; 21) is evacuated so that the residual components of the preceding vapor-phase reactant pulse remaining in the reaction space are at a level of less than 1 %, advantageously less than 1 ‰, prior to the inflow of the successive vapor-phase pulse.

4. A method as defined in any of foregoing claims 1 - 3, c h a r a c t e r i z e d in that an inactive gas is fed into said reaction space (1; 21) simultaneously as the reaction space is being evacuated from the residues of the latest vapor-phase reactant pulse.

5. A method as defined in claim 4, *characterized* in that to said reaction space is connected a pump (3; 24) having a volumetric capacity which during the interval between two successive vapor-phase reactant pulses is appreciably greater than the gas volume of the reaction space.

6. A method as defined in any foregoing claim, *characterized* in that each reactant is fed into said reaction space via a separate inflow path (22, 29; 23, 28) in order to minimize the gas volume to be evacuated from the reaction space.

7. A method as defined in any foregoing claim, *characterized* in that each vapor-phase reactant pulse is mixed with said inactive gas flow prior to its entry into said reaction space.

8. A method as defined in claim 1, in which method a reaction space is employed comprising a reaction chamber (13; 38) into which said substrate can be placed and further comprising gas flow channels (7, 8, 14 and 4; 22, 23, 28, 29, 25 and 24) communicating with said reaction chamber, said gas flow channels being suited for the inflow of said vapor-phase reactant pulses into said reaction chamber and, correspondingly, for the outflow of the nonreacted components of said reactant pulses from said reaction chamber, *characterized* in that at least a portion of said gas flow channels are provided with a narrow, oblong cross section in order to minimize the volume of said reaction space.

9. A method as defined in claim 1 or 8, in which method a reaction space is employed comprising a reaction chamber (13; 38) into which said substrate can be placed and further comprising gas flow channels (7, 8, 14 and 4; 22, 23, 28, 29, 25 and 24) communicating with said reaction chamber, said gas flow channels being suited for the inflow of said vapor-phase reactant pulses into said reaction chamber and, correspondingly, for the outflow of the nonreacted components of said reactant pulses from said reaction chamber, *characterized* in that

said reaction chamber (13; 38) is provided with a narrow, oblong cross section in order to minimize the volume of said reaction space.

10. A method as defined in claim 9, c h a r a c t e r i z e d in that said vapor-phase reactant pulses are fed via gas flow channels (7, 8, 14 and 4; 22, 23, 28, 29; 25 and 24) having a narrow, oblong cross section in order to form at least essentially planar pulses of vapor-phase reactant and to improve the intermixing of the vapor-phase reactant flow with a carrier gas flow.

11. A method as defined in claim 9, c h a r a c t e r i z e d in that said vapor-phase pulses of each reactant group are fed via their individual inflow channels (22, 29; 23, 28) directly into the reaction chamber, wherein the vapor-phase pulse is allowed to intermix with a carrier gas flow prior to bringing the reactant into contact with the substrate.

12. A method as defined in claim 1, c h a r a c t e r i z e d in that said vapor-phase reactant pulses are fed in an at least essentially laminar flow into said reaction chamber.

13. An apparatus for growing thin films onto a substrate by subjecting the substrate to alternately repeated surface reactions of vapor-phase reactants for the purpose of forming a solid-state thin film on the substrate, said apparatus comprising

- a reaction space (13; 38) into which the substrate can be placed,
- inflow channels (7; 22, 29, 23, 38) communicating with said reaction space, said channels being suited for feeding the reactants employed in a thin-film growth process in the form of vapor-phase pulses into said reaction space, and
- reactant outflow channels (4; 25) communicating with said reaction space, said channels being suited for the outflow of reaction products and excess amounts of reactants from said reaction space,

characterized in that

- the outflow channels (4; 25) are provided with a connection (3; 24) to a pump capable of evacuating said reaction space to a vacuum and said pump having a volumetric capacity which during the interval between two successive vapor-phase reactant pulses is greater than the gas volume of the reaction space.

14. An apparatus as defined in claim 13, characterized in that said pump has a volumetric capacity which during the interval between two successive vapor-phase reactant pulses is capable of evacuating at least twice the gas volume of the reaction space.

15. An apparatus as defined in claim 13 or 14, said apparatus comprising a reaction chamber (13; 38) into which the substrate can be placed and further comprising gas flow channels (7, 8, 14 and 4; 22, 23, 28, 29, 25 and 24) communicating with said reaction chamber, said gas flow channels being suited for the inflow of said vapor-phase reactant pulses into said reaction chamber and, correspondingly, for the outflow of the reaction products of said thin-film growth process and the excess amounts of said reactant pulses from said reaction chamber, characterized in that at least a portion of said gas flow channels are provided with a narrow, oblong cross section in order to minimize the volume of said reaction space.

16. An apparatus as defined in claim 15, characterized in that said reaction chamber (13; 38) is provided with a narrow, oblong cross section in order to minimize the volume of said reaction space.